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The Second Postulate of Special Relativity is Incompatible with the Observations

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Abstract

The Michelson-Morley experiment should have revealed that the speed of light is not isotropic, instead it resulted isotropic. In order to justify this result, FitzGerald and Lorentz hypothesized that all objects that move in the aether, undergo a contraction in the direction of motion, thus making the speed of light result isotropic, while in reality it is not. Instead Einstein formulated the Special Relativity, whose second postulate states that the speed of light would be isotropic in all inertial frames of reference. But Lorentz continued to support his thesis, because it had been demonstrated that light is a wave phenomenon which, therefore, needs a medium to manifest itself, so that its speed can be isotropic only relative to said medium and therefore not also relative to a inertial frame of reference moving relative to the medium. But it was Einstein that won Lorentz! But if the CMB and its dipole anisotropy, had already been observed at that time, who would have won? Lorentz would have won, because he could have demonstrated that the speed of light cannot be isotropic, thus invalidating the second postulate of the Special Relativity and, consequently, even the theory itself. Which I did, through two demonstrations.

Keywords: ***Michelson-Morley experiment; Aether; CMB; Special relativity; Speed of light; Isotropy***

Introduction

In 1887 the famous Michelson-Morley experiment was carry out. It should have revealed that the speed of light is not the same for all directions of origin (i.e. not isotropic) and, therefore, the so-called aether wind [1]. Which would be due to the motion of the Earth relative to the aether, i.e. the medium in which light would manifest itself, and therefore the only one relative to which the speed of light can be isotropic. But the experiment revealed that the speed of light result also isotropic relative to the Earth and, therefore, did not reveal any aether wind and subsequently no aether, either.

In order to justify this negative result, first (in 1889), George FitzGerald and then (in 1892), Endrick Lorentz, hypothesized that all objects that move in the aether, undergo a contraction in the direction of motion, for which the arm of the Michelson-Morley interferometer placed in the direction of motion, would have contracted, thus making the speed of light result isotropic, while in reality it is not [2-4].

However, in 1905 Albert Einstein intervened, who in one of his articles did not accept the justifications of FitzGerald and Lorentz, eliminated the need for the aether and formulated the theory of Special Relativity, whose second postulate states that “Any ray of light moves in the ‘stationary’ system of co-ordinates with the determined velocity c, whether the ray be emitted by a stationary or

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by a moving body", which means that the speed of light would be isotropic in all inertial frames of reference, including the Earth [5, 6]. But Lorentz, despite Einstein's constant attempts to convince him, continued to support his thesis until his death.

In fact, through a wise use of the transformations that bear his name, he managed to frame in his theory of the immobile aether those phenomena that seemed to imply an apparent partial or total dragging of the aether [7]. While admitting the greater simplicity of Einstein's theory, Lorentz do not accepted it, not intending to give up some fundamental principles on which two centuries of classical physics were based. Because it had been demonstrated that light is a wave phenomenon which, therefore, needs a medium to manifest itself, so that its speed can be isotropic only relative to said medium and therefore not also relative to a inertial frames of reference moving relative to the medium. Shouldn't this reasoning have been enough to agree with Lorentz? Instead, it was Einstein's theory that prevailed over Lorentz's! But if the Cosmic Microwave Background (CMB) (in 1965) and its dipole anisotropy had already been observed at that time, who would have won?

Lorentz would have won, because he could have demonstrated not only that the speed of light cannot be isotropic on the Earth, but also the speed of the Earth relative to the aether, thus invalidating the second postulate of the theory of Special Relativity and, consequently, even the theory itself [8, 9]. Which I did myself below through two demonstrations, where I will use the term "space" instead of "aether", because, as Einstein also stated, they are the same thing [10].

Demonstration using the Dipole Anisotropy of the CMB

According to the Big Bang theory, the Universe is expanding and about 380,000 years after the beginning of its expansion, the space became transparent to radiation, so a huge amount of photons began to spread freely from any location of space [11]. So that, unlike the other photons, which are emitted by celestial objects in motion relative to the space, it is as if they had been emitted from the space itself. Therefore, since the wave frequency of the photons is isotropic only relative to the emitter, they are the only photons whose wave frequency is isotropic relative to the space.

Photons were released from different locations of the space and have travelled in random directions, so some of them travelled towards the location where the Earth would have been in the future.

Since then these photons, which are referred to as CMB, have continued to reach the location of Earth, starting with those being released from the closest locations and then gradually from those further away [8].

Due to the expansion of Universe, their wavelength upon arrival on Earth is increased, and therefore their frequency is reduced, by about 1,100 times compared to the starting one, and is the same for all photons, except for some very slight anisotropies of the order of one part in 100,000 [12].

In addition to these anisotropies, which are intrinsic in nature of the CMB, it has been detected a particular anisotropy, called "dipole anisotropy", of about one part in 1,000, which depends on the direction of the CMB's provenance and that is due to the motion of the Earth, of about 370 km/s, relative to a particular location in which this anisotropy would not be detected [9].

Hence in that location it would appear that the wave frequency of the photons of the CMB would be isotropic, more precisely, would not be affected by the dipole anisotropy. But also its speed is isotropic, because the Michelson-Morley experiment showed that the speed of light is isotropic wherever it is measured.

Therefore, in this location both the speed and the wave frequency of the photons of the CMB, would be isotropic and since, as I will demonstrate with the thought experiment exposed in the next paragraph, the speed of the CMB can be isotropic only if its wave frequency is also isotropic, it is the only location where this speed can be truly isotropic.

That location can be only the one where the frequency of the CMB is measured, ie, the one where the Earth is transiting in the moment of measurement.

Therefore, as far as the Earth is concerned, the speed of photons travelling on its surface is isotropic only relative to locations of space where the Earth is travelling and not also relative to the Earth.

Demonstration by Thought Experiments

Let's imagine the Universe as a big rubber ball on whose surface many points are marked, which represent the locations in space.

Now let's imagine CMB photons like rows of cars, each of which represents a wave, that move on its surface at a constant speed, let's say 1ms^{-1}.

Now let's imagine the Earth as a pickup truck moving on the surface of the ball, but at a speed much lower than 1ms^{-1}, and let's assume that it is able to measure the speed of the cars relative to it. Then it would detect that they approach it at different speeds depending on the direction, and knowing that their speed is isotropic relative to the point they are passing through, with adequate calculations it could determine their own speed relative to the point it is passing through.

For example, if it measured the speed of only two cars, one coming from behind and the other in front, relative to the direction of its motion, and these were respectively 0.9 ms^{-1} and 1.1 ms^{-1}, the difference would be 0.2 ms^{-1} and its speed relative to that point would be the half, i.e. 0.1 ms^{-1}.

But if the truck measured a speed of 1 ms^{-1} for both of the cars (which would represent the Michelson-Morley experiment), it would mean that it doesn't have adequate tools to detect the exact speed and not that the cars are really moving relative to it at a speed of 1ms^{-1}, as this is impossible.

Let's now assume that in a certain point marked on the ball, two rows of cars are passing through coming from opposite directions and with the cars in each line spaced 0.1 meter apart.

A truck positioned at that point, in one second would count 10 cars coming from one direction and 10 from the other, and would measure a speed of 1ms^{-1} for each of them. Therefore both the frequency of the cars and their speed, would be isotropic.

Now, let's assume that the truck moves at a speed of 0.1 ms^{-1} in one of the two directions, in one second it would count 11 cars coming from the direction in which it is moving, and 9 cars coming from the opposite direction. So it would detect a difference of two cars between the two directions of origin (the difference represents the dipole anisotropy of CMB). And if it accurately measured the speed of the cars relative to itself, it would find that those coming from the forward direction would have a speed of 1.1 ms^{-1}, while those coming from behind would have a speed of 0.9 ms^{-1}.

Therefore, both the frequency and the speed of the cars would depend on the direction of origin and, therefore, they would be anisotropic but if it measured their speed isotropic (1 ms^{-1}) and their frequency anisotropic (11 and 9), it would mean that one of the two measurements was incorrect, namely that of the speed as shown in the previous experiment.

In conclusion, it appears that the speed of the cars is really isotropic only relative to the point in which they are moving and not also relative to the moving pickup truck and since the pickup truck represents the Earth and the cars the waves of the photons of the CMB, and the laws of physics that apply to them naturally also apply to all other photons, including those of light, it means that the speed of light cannot be isotropic relative to the Earth.

Conclusions

From the two demonstrations set out above, I think it is clear that since the speed of photons of the CMB can be isotropic only if their wave frequency is also isotropic, and that since from its dipole anisotropy it results that the wave frequency of photons of the CMB is not isotropic on the Earth, not even their speed can be isotropic relative to the Earth. Therefore, since the laws of physics which apply to the photons of the CMB also apply to all other photons, including those of light, this means that the speed of light cannot be isotropic on Earth.

Therefore the correct justification of the result of Michelson Morley's experiment cannot be that of Einstein, but that of FitzGerald and Lorentz.

Therefore the second postulate of Special Relativity is incompatible with the observations of CMB.

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